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CHARLES B. GORDON
THOMAS P. SCHILLER
DAVID B. DEIOMA
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HOWARD G. SHIMOLA
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JAMES M. MOORE
MICHAEL W. GARVEY
RICHARD A. SHARPE
RONALD M. KACHMARIK
PAUL A. SERBINOWSKI
AARON A. FISHMAN
BRIAN G. BEMBENICK

PEARNE & GORDON LLP
ATTORNEYS AT LAW
1801 EAST 9th STREET
SUITE 1200
CLEVELAND, OHIO 44114-3108
TEL: (216) 579-1700 FAX: (216) 579-6073
EMAIL: ip@pearnegordon.com
WRITER'S DIRECT EMAIL: jmurtaugh@pearnegordon.com

ROBERT F. BODI
SUZANNE B. GAGNON
UNA L. SCHUMACHER
STEVEN J. SOLOMON
GREGORY D. FERNENGEL

OF COUNSEL
LOWELL L. HEINKE
THADDEUS A. ZALENSKI

PATENT, TRADEMARK, COPYRIGHT AND RELATED INTELLECTUAL PROPERTY LAW

May 5, 2005

Attn: The Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Re: U.S. Patent No. 09/904,084
Issued: November 2, 2004
Title: LOW CONDUCTIVITY, THERMAL BARRIER COATING AND SINTERING-RESISTANT
Inventors: Dongming Zhu, et al.
Our Docket No.: 33253US1

Sir:

A Certificate of Correction under 35 U.S.C. 254 is hereby requested to correct Patent Office printing errors in the above-identified patent. Enclosed herewith is a proposed Certificate of Correction (Form No. PTO-1050) and documentation in support of the proposed corrections for consideration.

It is requested that the Certificate of Correction be completed and mailed at an early date to the undersigned attorney of record.

Respectfully submitted,

By John P. Murtaugh
John P. Murtaugh, Reg. No. 34226

JPM/nra
Enclosures: Form PTO/SB/44

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date indicated below.

John P. Murtaugh
Name of Attorney for Applicant(s)

May 12 2005 John P. Murtaugh
Date Signature of Attorney

PTO/SB/44 (07-03)
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,812,176 B1 PAGE 1 OF 1

DATED : April 25, 2005

INVENTOR(S) : Dongming Zhu, et al.

It is certified that errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Specification 1, line 20, after "NASA." and insert therefore - -This invention was made with Government support under contract NCC3-617 awarded by NASA. The Government has certain rights in this invention. - -.

Claim 24, line 2, before "17", insert - -7, - -.

MAILING ADDRESS OF SENDER: John P. Murtaugh
Pearne & Gordon LLP
1801 East 9th Street
Suite 1200
Cleveland, Ohio 44114-3108

PATENT NO. 6,812,176

No. of additional copies
⇨ 0

MAY 2 3 2005

OFFICIAL **09/904,084**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Dongming Zhu et al.

Title: LOW CONDUCTIVITY AND SINTERING-RESISTANT THERMAL BARRIER COATINGS

Serial No.: 09/904,084 Group Art Unit: 1762

Filing Date: July 12, 2001

Docket No.: 33253US1

PRELIMINARY AMENDMENT "B"

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to the examination of the above-identified application, please amend the application as follows.

IN THE SPECIFICATION:

Please delete the text in the STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT section and replace it with the following text:

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington D.C. 20231 on the date indicated below.

Brian Alan Bargmeyer
Name of Attorney for Applicant(s)

March 3, 2003 B A B
Date Signature of Attorney

The U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of Contract NCC3-617 awarded by NASA.

This invention was made with Government support under contract NCC3-617 awarded by NASA. The Government has certain rights in this invention.

REMARKS

This preliminary amendment is filed to satisfy formal requirements. If there are any fees required by this communication, please charge such fees to our Deposit Account No. 16-0820, Order No. 33253US1.

Respectfully submitted,

PEARNE & GORDON LLP

By _____
Brian Alan Bargmeyer, Reg. No. 47404

526 Superior Avenue East
Suite 1200
Cleveland, Ohio 44114
(216) 579-1700

Date: March 3, 2003

Version of Specification Section Showing Changes

In the STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT section:

The U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of Contract NCC3-617 awarded by NASA.

This invention was made with Government support under contract NCC3-617 awarded by NASA. The Government has certain rights in this invention.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No	09/904,084	Confirmation No.1872
Applicant	Dongming Zhu, et al.	
Filed	July 12, 2001	
TC/A.U.	1755	
Examiner	PAUL D. MARCANTONI	
Title	LOW CONDUCTIVITY AND SINTERING-RESISTANT THERMAL BARRIER COATINGS	
Docket No.	33253US1	
Customer No.	000116	

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Amendment "C"

Sir:

This amendment is filed in response to the Office action dated October 27, 2003 (Paper No. 9). The three month period for responding to the Office action expired on January 27, 2004. Applicants hereby request and petition for a one (1) month extension of time to respond, through February 27, 2004.

By this amendment, there are a total of 58 claims pending in the application (38 in excess of 20), including 4 independent claims (1 in excess of 3). Please charge the $770 extra-claim fee and the $110 extension of time fee to our Deposit Account No. 16-0820, Order No. 33253US1.

Please amend the above-identified application in the following manner.

I hereby certify that this paper is being facsimile transmitted to facsimile no. (703) 872-9306 at the Patent and Trademark Office on the date shown below.

Steven J. Solomon		February 4, 2004
Name of Attorney for Applicant(s)	Signature of Attorney	Date

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks begin on page 12 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A thermal barrier coating composition comprising 46-97 molar percent base oxide, 2-25 molar percent primary stabilizer, 0.5-25 molar percent group A dopant, and 0.5-25 molar percent group B dopant, said base oxide being selected from the group consisting of ZrO_2, HfO_2 and combinations thereof, said primary stabilizer being selected from the group consisting of Y_2O_3, Dy_2O_3, Er_2O_3 and combinations thereof, ~~said group A dopant being selected from the group consisting of rare earth oxides, alkaline earth metal oxides, transition metal oxides and combinations thereof, and~~ said group B dopant being selected from the group consisting of Nd_2O_3, Sm_2O_3, Gd_2O_3, Eu_2O_3 and combinations ~~there~~ thereof, and said group A dopant being selected from the group consisting of rare earth oxides, alkaline earth metal oxides, transition metal oxides and combinations thereof, but excluding those species contained in said base oxide, group B dopant and primary stabilizer groups,

wherein the ratio of the molar percentages of group A dopant to group B dopant in said composition is between about 1:8 and about 8:1.

2. (original) A thermal barrier coating composition according to claim 1, wherein the group A dopant is selected from the group consisting of Sc_2O_3, Yb_2O_3,

MgO, NiO, Cr_2O_3, CoO, Fe_2O_3, TiO_2, RuO_2, Ta_2O_5, and combinations thereof.

3. (original) A thermal barrier coating composition according to claim 1, wherein the group A dopant and the group B dopant are present in the composition in substantially equal molar percentages.

4. (currently amended) A thermal barrier coating composition according to claim 1, wherein the ratio of the molar percentages of group A dopant to group B dopant is between about ~~1:8 and 8:1~~ 1:4 and about 4:1.

5. (currently amended) A thermal barrier coating composition according to claim 1, wherein the ratio of the molar percentage of the primary stabilizer to the sum of the molar percentages of the ~~Group~~ group A dopant and the ~~Group~~ group B dopant is between 1:1 and 10:1.

6. (currently amended) A thermal barrier coating composition according to claim 1, said composition being a ceramic alloy solid solution having a zirconia or hafnia lattice structure or structures, wherein the ionic radius of the group A dopant cation is smaller than the ionic radius of the primary stabilizer ~~oxide~~ cation ~~or the base oxide cation~~ in said ceramic alloy solid solution.

7. (canceled).

8. (currently amended) A thermal barrier coating composition comprising 46-97 molar percent base oxide, 2-25 molar percent primary stabilizer, 0.5-12.5 molar percent group A dopant, and 0.5-12.5 molar percent group B dopant, said base oxide being selected from the group consisting of ZrO_2, HfO_2 and combinations thereof, said primary stabilizer being selected from the group consisting of Y_2O_3, Dy_2O_3, ~~and~~ Er_2O_3 and combinations thereof, ~~said group A dopant being selected from the group consisting of rare earth oxides, alkaline earth metal oxides, transition metal oxides and combinations thereof, and~~ said group B dopant being selected from the group consisting of Nd_2O_3, Sm_2O_3, Gd_2O_3, Eu_2O_3 and combinations thereof, and said group A dopant being selected from the group consisting of rare earth oxides, alkaline earth metal oxides, transition metal oxides and combinations thereof, but excluding those species contained in said base oxide, group B dopant and primary stabilizer groups,

wherein the ratio of the molar percentages of group A dopant to group B dopant in said composition is between about 1:8 and about 8:1.

9. (original) A thermal barrier coating composition according to claim 8, wherein the group A dopant is selected from the group consisting of Sc_2O_3, Yb_2O_3, MgO, NiO, Cr_2O_3, CoO, Fe_2O_3, TiO_2, RuO_2, Ta_2O_5, and combinations thereof.

10. (original) A thermal barrier coating composition according to claim 8, wherein the group A dopant and the group B dopant are present in the composition

in substantially equal molar percentages.

11. (currently amended) A thermal barrier coating composition according to claim 8, wherein the ratio of the molar percentages of group A dopant to group B dopant is between about ~~1:8 and 8:1~~ 1:4 and about 4:1.

12. (currently amended) A thermal barrier coating composition according to claim 8, wherein the ratio of the molar percentage of the primary stabilizer to the sum of the molar percentages of the ~~Group~~ group A dopant and the ~~Group~~ group B dopant is between 1:1 and 10:1.

13. (currently amended) A thermal barrier coating composition according to claim 8, said composition being a ceramic alloy solid solution having a zirconia or hafnia lattice structure or structures, wherein the ionic radius of the group A dopant cation is smaller than the ionic radius of the primary stabilizer ~~oxide~~ cation ~~or the base oxide cation~~ in said ceramic alloy solid solution.

14. (canceled).

15. (canceled).

16. (currently amended) A thermal barrier coating composition comprising

46-97 molar percent base oxide, 2-25 molar percent primary stabilizer, and 0.5-25 molar percent each of ~~a compound~~ at least two compounds selected from the group consisting of group A dopants and group B dopants, said base oxide being selected from the group consisting of ZrO_2, HfO_2 and combinations thereof, said primary stabilizer being selected from the group consisting of Y_2O_3, Dy_2O_3, and combinations thereof, ~~said group A dopant, if present, being selected from the group consisting of rare earth oxides other than Er_2O_3, alkaline earth metal oxides, transition metal oxides and combinations thereof, and~~ said group B dopant~~, if present,~~ being selected from the group consisting of Nd_2O_3, Sm_2O_3, Gd_2O_3, Eu_2O_3 and combinations thereof, and said group A dopant being selected from the group consisting of rare earth oxides other than Er_2O_3, alkaline earth metal oxides, transition metal oxides and combinations thereof, but excluding those species contained in said base oxide, group B dopant and primary stabilizer groups.

17. (currently amended) A thermal barrier coating composition according to claim 16, wherein the group A dopant~~, if present,~~ is selected from the group consisting of Yb_2O_3, Sc_2O_3, MgO, NiO, Cr_2O_3, CoO, Fe_2O_3, TiO_2, and RuO_2.

18. (currently amended) A thermal barrier coating composition according to claim 16, said composition being a ceramic alloy solid solution having a zirconia or hafnia lattice structure or structures, wherein the ionic radius of the group A dopant cation~~, if present,~~ is smaller than the ionic radius of the primary stabilizer ~~oxide~~

cation ~~or the base oxide cation~~ in said ceramic alloy solid solution.

19. (canceled)

20. (currently amended) A thermal barrier coating composition according to claim 16, wherein the ratio of the molar percentage of the primary stabilizer to the sum of the molar ~~percentage~~ percentages of the ~~Group~~ group A dopant ~~or~~ and the ~~Group~~ group B dopant is between 1:1 and 10:1.

21. (new) A thermal barrier coating composition according to claim 1, wherein the ratio of the molar percentages of group A dopant to group B dopant is between about 1:2 and about 2:1.

22. (new) A thermal barrier coating composition according to claim 1, wherein the ratio of the molar percentages of group A dopant to group B dopant is between about 1.5:1 and about 1:1.5.

23. (new) A thermal barrier coating composition according to claim 1, wherein the ratio of the molar percentages of group A dopant to group B dopant is between about 1.1:1 and about 1:1.1.

24. (new) A thermal barrier coating composition according to any one of

claims 4, 21, 22 or 23, wherein the group A dopant is selected from the group consisting of Sc_2O_3, Yb_2O_3, MgO, NiO, Cr_2O_3, CoO, Fe_2O_3, TiO_2, RuO_2, Ta_2O_5, and combinations thereof.

25. (new) A thermal barrier coating composition according to any one of claims 4, 21, 22 or 23, said composition being a ceramic alloy solid solution having a zirconia or hafnia lattice structure or structures, wherein the ionic radius of the group A dopant cation is smaller than the ionic radius of the primary stabilizer cation in said ceramic alloy solid solution.

26. (new) A thermal barrier coating composition according to any one of claims 1, 4, 21, 22 or 23, said group A dopant being Yb_2O_3, Sc_2O_3 or a mixture thereof.

27. (new) A thermal barrier coating composition according to any one of claims 1, 4, 21, 22 or 23, said group A dopant being Yb_2O_3, TiO_2, Ta_2O_5 or a mixture thereof.

28. (new) A thermal barrier coating composition according to any one of claims 1, 4, 8, 21, 22 or 23, said base oxide being ZrO_2, said group A dopant being Yb_2O_3, said group B dopant being Gd_2O_3, and said primary stabilizer being Y_2O_3.

29. (new) A thermal barrier coating composition according to claim 1, comprising 1.5-5 molar percent group A dopant and 1.5-5 molar percent group B dopant.

30. (new) A thermal barrier coating composition according to any one of claims 1, 4, 21, 22 or 23, said group A and group B dopants each being selected to have a high free energy of formation such that each of said group A and group B dopants exhibits high stability in an oxygen-containing atmosphere.

31. (new) A thermal barrier coating composition according to any one of claims 1, 4, 8, 16, 21, 22 or 23, said group A and group B dopants being selected to provide a mixture of dopants effective to promote complex defect structures and improved lattice scattering in said thermal barrier coating composition.

32. (new) A thermal barrier coating composition comprising a ceramic alloy solid solution having a base oxide lattice structure or structures where the base oxide is present in the solid solution in an amount of 46-97 molar percent, the solid solution further comprising 2-25 molar percent primary stabilizer, 0.5-25 molar percent group A dopant, and 0.5-25 molar percent group B dopant, said base oxide being selected from the group consisting of ZrO_2, HfO_2 and combinations thereof, said primary stabilizer being selected from the group consisting of Y_2O_3, Dy_2O_3, Er_2O_3 and combinations thereof, each of said group A dopant and said group B

dopant being selected from the group consisting of rare earth oxides, alkaline earth metal oxides, transition metal oxides and combinations thereof, but excluding those species contained in said base oxide and primary stabilizer groups,

wherein said group A dopant is selected such that the ionic radius of the group A dopant cation is smaller than the ionic radius of the primary stabilizer cation in said solid solution,

and wherein said group B dopant is selected such that the ionic radius of the group B dopant cation is larger than the ionic radius of the primary stabilizer cation in said solid solution,

the ratio of the molar percentages of group A dopant to group B dopant in said solid solution being between about 1:8 and about 8:1.

33. (new) A thermal barrier coating composition according to claim 32, wherein the ratio of the molar percentages of group A dopant to group B dopant in said solid solution is between about 1:4 and about 4:1.

REMARKS

Applicants' counsel thanks Examiner Marcantoni for his careful and thorough examination of the present application. The undersigned also thanks the Examiner for the very helpful telephone conversation of February 2, 2004 during which the application was discussed.

The claims have been amended, and new claims 21-33 have been added, to more clearly describe the invention. No new matter has been entered. For the Examiner's convenience, basis for the following amended (and new) claims can be found, e.g., in the application as follows:

Claim(s)	Basis in application
1,8	Claim 4 as filed
4,11,21,22,23,33	Pg. 5 lines 16-23
6,13,18,25	Pg. 7, lines 18-25
24	Claim 2 as filed
26	Pg. 4 lines 10-11
27	Pg. 4 lines 10-15
28	Pg. 4 line 2 to Pg. 5 line 10
29	Pg. 4, Table
30	Pg. 8 lines 10-18
31	Pg. 7 lines 5-9 and 18-25
32	Claims 1 and 4 as filed, Pg. 5 lines 3-5 and 12-14

The claims have been rejected under 35 USC § 112, second paragraph based on an alleged "vagueness" as to which rare earth metal oxides are the

primary stabilizer, group A dopant, and group B dopant. (See Office action, last paragraph beginning on page 2). Claims 1, 8 and 16 have been amended to recite "said group A dopant being selected from the group consisting of rare earth oxides, alkaline earth metal oxides, transition metal oxides, and combinations thereof, but excluding those species contained in said base oxide, group B dopant and primary stabilizer groups." This language clearly delineates the scope of the group A dopant group, vis-a-vis the other component groups recited in the claims. During the above-mentioned telephone conversation it was agreed that this language appeared to overcome the Section 112 rejections.

Claims 1-20 also were rejected under 35 USC § 102(b), or alternatively under 35 USC § 103(a), as being allegedly anticipated by, or obvious over, Fehrenbacher. Independent claims 1 and 8 now have been amended to recite "the ratio of the molar percentages of group A dopant to group B dopant in said composition is between about 1:8 and about 8:1." Fehrenbacher does not disclose such a limitation; i.e. where a ratio of the molar percentage of the group A dopant to that of the group B dopant (as they are defined in the pending claims) is between about 1:8 and about 8:1.

Neither does Fehrenbacher fairly suggest such a limitation. Turning substantively to the reference, Fehrenbacher teaches a

> type C mixed rare earth oxide solution compris[ing] primarily oxides of dysprosium, erbium, ytterbium, and holmium, with small amounts of oxides of thulium, lutetium, and terbium. ....A typical solid solution used was found to have 15.2 percent Yb_2O_3, 45.0 percent Dy_2O_3, 28.0 percent Er_2O_3, 9.2 percent Ho_2O_3, 1.3 percent Tb_2O_3, 1.0 percent Tm_2O_3, and 0.3 percent Lu_2O_3.

Fehrenbacher, col. 1 lines 58-65.

None of the components listed in Fehrenbacher above falls into the "group B dopant" category as the group B dopant is described in either of independent claims 1 or 8 (where the group B dopant is selected from the group consisting of Nd_2O_3, Sm_2O_3, Gd_2O_3, Eu_2O_3 and combinations thereof). Therefore, Fehrenbacher cannot anticipate, suggest or make obvious the ratio of group A to B dopants now recited in those claims.

Independent claim 16 recites a composition comprising "at least two compounds selected from the group consisting of group A dopants and group B dopants," with the group B dopant defined as in claims 1 and 8, and the group A dopant also defined as in claims 1 and 8 except the group A dopant explicitly excludes Er_2O_3. (See claim 16: "said group A dopant being selected from the group consisting of rare earth oxides *other than* Er_2O_3"). Conversely, the "type C mixed earth oxide solution" disclosed in Fehrenbacher above includes Er_2O_3, typically 28.0 percent of it. Therefore, Fehrenbacher neither discloses nor suggests the composition recited in claim 16.

New independent claim 32 has been added, and is drawn to a novel composition where the group A and B dopants are defined respectively based on the size of their respective cationic radii relative to the cationic radius of the primary stabilizer. The ratio of the group A to B dopants in claim 32 is in the range of about 1:8 to about 8:1. The novel composition of claim 32 is heretofore unknown in the prior art, and therefore is submitted as being presently allowable.

All remaining claims are dependent claims, and are believed to be allowable as such. In view of the foregoing, it is respectfully submitted that all claims are in condition for allowance, and a notice to that effect is respectfully requested.

Should the Examiner have any questions regarding this submission, or for any other reason which may expedite prosecution of the application, the Examiner is invited to please contact the undersigned attorney at the phone number listed below.

If there are any additional fees not mentioned above resulting from this communication, please the charge same to our Deposit Account No. 16-0820, our Order No. 33253US1.

Respectfully submitted,

PEARNE & GORDON LLP

By _____
Steven J. Solomon, Reg. No. 48719

1801 East 9th Street
Suite 1200
Cleveland, Ohio 44114-3108
(216) 579-1700

Date: February 4, 2004